Winter flounder is managed as three stocks: Gulf of Maine: Southern New England and Middle Atlantic: and Georges Bank. In the Southern New England-Middle Atlantic stock, biomass declined from 39,000 mt in 1981 to a record low of 8,500 mt in 1992. The stock has increased slightly in recent years but it still remains overexploited and winter flounder are stated to be overfished, based on fishing mortality rate (NEFMC 1998). Peak commercial landings were recorded around 1965 and 1980.

The Long Island Sound lobster population supports the second most valuable commercial fishery within Long Island Sound. Lobster fishing is a year-round activity and there is a considerable quantity of lobster gear on the bottom of Long Island Sound. Recreational fishing occurs in coastal waters, but exact estimates of the catch are not available. Landings in the U.S. inshore fishery were relatively stable from 1965 to 1975, ranging from 10,300 to 12,200 mt (mt), and averaging 11,100 mt. Landings then rose steadily from 12,900 mt in 1978 to a record 24,000 mt in 1991. After declining somewhat in 1992–1993, the upward trend resumed, with landings reaching 29,200 mt in 1996. This increase can be attributed both to increased abundance and a continuing increase in effort, especially in the number of pots and extent of area fished (NMFS 1999).

Long Island Sound provides spawning, feeding, and nursery habitat for many migratory species including winter flounder, windowpane flounder, scup, squid, butterfish and skate (See section 3.2.1.1 for more detail). Windowpane flounder are not a target of the commercial fishing industry, but are mainly bycatch of the bottom trawl fisheries. Two stocks are identified in fishery management: the northern stock (Gulf of Maine–Georges Bank) and the southern stock (New England–Middle Atlantic). Commercial landings of the southern stock peaked around 1985, but have been declining rapidly in recent years (NEFMC 1998). According to NMFS (2001d), windowpane flounder are overfished.

Scup are reported in Long Island Sound from April through November and are the second most commonly identified species in trawl surveys conducted by the CTDEP. The stock is currently overexploited and at a low biomass level (NEFMC 1998). Total landings in northeast waters have declined from an annual average of 10,900 mt in 1977–1986 to only 3,500 mt in 1995–1996, with markedly reduced landings reported in both commercial and recreational fisheries. Recreational catches have accounted for 20–50% of the annual total during the past ten years. The 1995 recreational catch (600 mt) was the lowest in the 1979–1996 time series and the 1996 catch (1000 mt) was the second lowest. The biomass index values for seasonal bottom trawl surveys taken in recent years are among the lowest on record and indicate substantial declines in abundance from 1970s levels (NMFS 1999).

Butterfish were among the most abundant species recorded in the CTDEP trawl survey of 1997. Approximately 900,000 pounds of butterfish are caught each year in Long Island Sound and they are present on all bottom types and at various depths, although abundance is highest over mud and transitional bottoms (Gottschall et al. 2000).

Long-finned squid are commonly taken throughout Long Island Sound from May through November (NOAA 1999). Abundance is highest over mud bottom, with transitional and sand bottoms ranking second and third (Gottschall et al. 2000).

According to NMFS (2001d), summer flounder are found throughout the year in Long Island Sound. However, NOAA (1994, 1999) reports that summer flounder are rare in Long Island Sound, although this offshore spawner may use Long Island Sound as a summer feeding area. It is likely that some winter flounder are misidentified as summer flounder and the majority of the summer flounder population is found on the Atlantic coast of Long Island, not in Long Island Sound. Commercial landings of summer flounder in the northeast averaged 13,700 mt during 1979–1986, reaching a high of 17,100 mt in 1984. Commercial landings during 1989–1996 are markedly lower (4,200 to 8,100 mt per year). In 1996, commercial landings fell to 5,800 mt, 17 percent lower than in 1995. The recreational fishery for summer flounder harvests a significant proportion of the total catch. and in some years. recreational landings have exceeded the commercial total. Recreational landings have historically constituted about 40 percent of the total landings. Recreational landings averaged 9.000 mt during 1979–1986. and peaked at 14,100 mt in 1980. Since 1987. recreational landings have been considerably lower. although recent trends have been upwards. In 1996, recreational landings increased to 4.700 mt. the highest level observed since 1988 (NMFS 1999).

Adult and juvenile bluefish are commonly found in Long Island Sound. Total landings along the east coast of the United States peaked in 1981 at an estimated 51.400 mt. Landings have since declined substantially; the 1994–1996 average (11.400 mt) was only 27% of the 1977–1986 average (41.600 mt). The recreational component of the fishery, which has historically constituted 80–90% of the total catch, peaked in 1981 at nearly 44.000 mt. Commercial landings peaked in 1981 at 7.500 mt, and averaged 6.200 mt annually from 1987–1991. In 1996, landings were only 3,900 mt (NMFS 1999).

Additional species that are found in Long Island Sound include Atlantic herring, red hake. Atlantic salmon, silver hake, striped bass, and various types of shellfish.

NMFS (2001d) determined that Atlantic herring are not currently overfished in the coastal and offshore waters of the United States. New England Atlantic herring stocks were extremely abundant in the 1960s and were fished intensively through the early 1970s, until the stock collapsed. Landings remained low for about 10 years, but stock biomass is now high and apparently increasing. However, commercial landing have remained constant at approximately 50,000 tons per year in New England waters, since the 1970s (NEFMC 1998).

Based on an assessment of the stock size, NMFS (2001d) determined that red hake is currently overfished. The adult red hake are found associated with the bottom in brackish and saline waters of Long Island Sound. Red hake in Long Island Sound belong to the Southern Stock, which has remained relatively stable from the mid-1960s until the 1980s, when it sharply declined. A short period of increase was reported for 1990–1991. Total commercial landings during the last decade (1987–1996) averaged 1,700 mt annually. In 1996, landings were 35% lower than the 1987–1996 average and remain far below historic levels.

Atlantic salmon, which are common in Long Island Sound, are also considered to be overfished (NMFS 2001d). The by-catch during commercial fishing for other species has been a significant source of mortality for Atlantic salmon (NEFMC 1998). The last two decades mark a period of decline in stock status for all Atlantic salmon populations of the North Atlantic.

The majority of the silver hake catches have occurred in the center of Long Island Sound. While the Gulf of Maine/Northern Georges Bank stock is not overfished, the Southern Georges Bank/Middle Atlantic stock, which includes Long Island Sound, is overfished. Commercial and recreational landings of the southern stock declined in the 1960s and 1970s. The decline was followed by an increase in stock size until about 1985, at which point the stock began a decline to the historically low levels seen in recent years (NEFMC 1998).

In recent years, recreational landings of striped bass in New England waters have substantially exceeded commercial landings. In 1996, the estimated recreational harvest (6,700 mt) was over three times the level of commercial landings. During 1996, an estimated 14 million striped bass were caught by recreational anglers; over 90 percent of these were released alive (NMFS 1999).

The ocean quahog is a major component of the commercial fishery of Long Island Sound. Total ocean quahog landings along the northeast coast of the United Stated increased dramatically between

1976 and 1979, from 2,500 to 15,800 mt of meats per year. Landings in 1995 (22,200 mt) and in 1996 (21,600 mt) were typical of annual landings since 1987. Twenty-two percent of the total quahog population is found off the coast of Long Island.

3.3.3.2 Landings Data

Commercial Fisheries

Commercial fishery landings data for 2000 in New York and Connecticut were obtained from National Marine Fisheries, Fisheries Statistics Division (NMFS 2001d). The landings data presented in Tables 3.3.3.2-1 and 3.3.3.2-2 provide information on both finfish and shellfish landings as well as market value. The data refer to all waters for New York and Connecticut, which includes Long Island Sound, but are not specific to Long Island Sound.

The total 2000 commercial landings in New York for both finfish and shellfish were 42.0 million pounds, with a market value of $59 million. Finfish landings accounted for approximately 42% of the total landings and 27% of the total market value. Silver hake dominated the commercial finfish landings with over 4 million pounds. Species that had landings greater than one million dollars included the bluefish (1.8 million pounds), and the spiny dogfish shark (1.9 million pounds). The species that generated the greatest monetary value include the silver hake ($2.3 million), tilefish ($2.0 million), summer flounder ($1.9 million), striped bass ($1.5 million), and winter flounder ($1.0 million). The most valuable species, with the highest price per pound value, are the bluefin tuna at $4.68/lb, swordfish at $2.76/lb, and the striped bass at $2.78/lb.

New York shellfish landings accounted for approximately 58% of the total landings and 73% of the total market value. Longfin squid dominated the commercial shellfish landings with over 12.0 million pounds. Shellfish with landings over one million pounds included the Atlantic surf clam (5.5 million pounds), American lobster (2.9 million pounds), and the quahog clam (2.3 million pounds). The five species that generated the most money included the quahog clam (17.5 million), American lobster ($11.9 million), longfin squid (7.6 million), Atlantic surf clam (3.6 million), and the Eastern oyster (1.3 million). The most valuable species, with the highest price per pound value, were the bay scallop ($15.12/lb), quahog ($7.47/lb), and the eastern oyster ($3.77/lb).

The total 2000 commercial finfish and shellfish landings in Connecticut were 19.5 million pounds with a market value of $31.2 million. Finfish landings accounted for 57% of the total landings and only 21% of the total market value. Silver hake (6.2 million pounds), goosefish (1.5 million pounds), and skates (1.0 million pounds) dominated the commercial finfish landings. The species that generated the most money were the silver hake ($2.7 million) and the goosefish ($1.5 million). The most valuable species, with the highest price per pound value, were the tuna species at $3.91/lb, the yellowfin tuna at $2.88/lb, and summer flounder at $2.63/lb.

Connecticut shellfish landings accounted for approximately 43% of the total landings and 79% of the total market value. The quahog clam dominated the commercial shellfish landings with over 4.0 million pounds. Shellfish with landings over one million pounds included the American lobster (1.3 million pounds) and general shellfish species (1.2 million pounds). The four species that generated the most money included the quahog clam ($9.4 million), American lobster ($5.5 million), eastern oyster ($4.8 million), and the sea scallop ($4.0 million). The most valuable species, with the highest price per pound value, were the eastern oyster ($7.76/lb), sea scallop ($5.04/lb), American lobster ($3.95/lb) and the quahog clam ($2.34/lb).

Commercial harvesting of finfish and shellfish is a major use of Long Island Sound. The 1990 value of landings from Long Island Sound waters amounted to $35 million for Connecticut (CTDEP. Bureau of Fisheries and Wildlife. Division of Marine Fisheries) and approximately $18 million for New York (NYSDEC. Marine Division) for an estimated total value of $53 million. This value underestimates the total value of commercial fishing because only the major commercial species were counted (Altobello 1992).

Commercial fishery landings specific to Long Island Sound were obtained from National Marine Fisheries for the period 1994–1996. Total landings for Long Island Sound in 1994 were 16.9 million pounds with a value of $45 million. The highest landings included the eastern oyster (5 million pounds/$32 million), American lobster (2.3 million pounds/$6.2 million), silver hake (1.9 million pounds/$321,000), squid (1.8 million pounds/$641,000), and quahogs (1.2 million pounds/$2.7 million). In 1995, the total number of commercial landing had decreased by half to 8.4 million pounds but had increased in value to $33.7 million. Landings were again dominated by the eastern oyster (5 million pounds/$32 million) and the quahog clam (2 million pounds/$600,000). In 1996, the total number of commercial landings decreased again to 5.7 million pounds with a value of $31.3 million. The oyster (4 million pounds/ $28.9 million) dominated the landings. Of the other important commercial fish, the winter flounder landings ranged from 300,000 pounds in 1994 to 100,000 pounds in 1995. The landings of windowpane flounder ranged from 149 pounds (1994) to 2.2 thousand pounds (1995 & 1996).

The lobster fishery is extremely important and the fishermen are very territorial; however, there is little information available on landings and dollar value for specific areas in Long Island Sound. In recent years a virus has had a negative impact on the lobster fishery, causing concern among fishermen and scientists alike. Lobsters prefer well-oxygenated gravelly or sandy habitat that has some relief. After the pipeline is placed and the sediment from the trenching process has settled, the area around the pipeline would be oxygenated and have the relief that is preferred by lobster.

Recreational Fisheries

The number of individuals participating in recreational fishing off the Connecticut coast ranged from 237,000 to 410,000 per year from 1985 to 1989 for an average of 330,000 individuals per year. For the same period, the estimated number of participants fishing off the New York coast in Long Island Sound was 221,000 per year (Altobello 1992).

Seven species important to recreational fisherman in Long Island Sound include bluefish, scup, striped bass, summer flounder, tautog, weakfish, and winter flounder. Data for recreational fishing in 1998 were obtained from the NMFS Marine Recreational Fisheries Statistics survey. The survey provides information on both coastal and inland waters in New York and Connecticut. The inland waters include bays, estuaries, and sounds.

The 1998 commercial fishery catch for New York inland waters was approximately 7.8 million fish (Table 3.3.2-1). Flounder, bluefish, scup, tautog and striped bass comprised 75% of the total catch. Flounder dominated the catch with 2.7 million fish caught. The flounder catch was comprised mostly of summer flounder (2.4 million). Bluefish (1.2 million), scup (910,000), tautog (547,000) and striped bass (533,000) were also abundant. The total weight of fish harvested from New York inland waters was 4.9 million pounds. Flounder and bluefish comprise nearly 75% of the total harvested catch. Two million pounds of flounder and 1.2 million pounds of bluefish were harvested (NMFS 1998).

Table 3.3.3.2-1. 2000 Annual Commercial Landings in New York.			
Species	**Pounds**	**Dollars**	**Price/Pound**
ALEWIFE	490	$66	$0.13
AMBERJACK	5	$3	$0.60
BASS, STRIPED	542.617	$1.509.776	$2.78
BLUEFISH	1.805.597	$632.290	$0.35
BONITO, ATLANTIC	25,709	$26.451	$1.02
BURBOT	184	$120	$0.65
BUTTERFISH	849.059	$461.114	$0.54
CARP, COMMON	5,420	$1,646	$0.30
CATFISHES & BULLHEADS	6,744	$5,058	$0.75
COBIA	101	$170	$1.68
COD, ATLANTIC	89,217	$122,952	$1.38
CONGER EEL	17,671	$13,042	$0.74
CRAPPIE	205	$379	$1.85
CROAKER, ATLANTIC	285	$112	$0.39
CUNNER	3,817	$11,597	$3.04
CUSK	351	$19	$0.05
DOLPHIN	10,550	$19,593	$1.86
DORY, AMERICAN JOHN	16,392	$7,690	$0.47
DRUM, BLACK	60	$16	$0.27
DRUM, RED	1,215	$2,101	$1.73
EEL, AMERICAN	188	$220	$1.17
ESCOLAR	1,355	$1,614	$1.19
FLATFISH, UNC	18,769	$3,626	$0.19
FLOUNDER, SUMMER	799,845	$1,974,573	$2.47
FLOUNDER, WINDOWPANE	81,770	$31,246	$0.38
FLOUNDER, WINTER	957,152	$1,003,497	$1.05
FLOUNDER, WITCH	13,647	$15,139	$1.11
FLOUNDER, YELLOWTAIL	561,158	$596,996	$1.06
GOOSEFISH	749,860	$878,713	$1.17
HADDOCK	11,926	$11,937	$1.00
HAKE, RED	838,788	$306,704	$0.37
HAKE, SILVER	4,159,659	$2,340,233	$0.56
HAKE, WHITE	39,571	$12,530	$0.32
HERRING, ATLANTIC	57,746	$12,999	$0.23
JACK, CREVALLE	685	$595	$0.87
KING WHITING	7,673	$5,338	$0.70
LADYFISH	63	$13	$0.21
LAUNCES	290	$312	$1.08
LEATHERJACKETS	2,453	$2,443	$1.00
LUMPFISH	28	$23	$0.82

Table 3.3.3.2-1. continued.
2000 Annual Commercial Landings in New York.

Species	Pounds	Dollars	Price/Pound
MACKEREL, ATLANTIC	138,338	$54,944	$0.40
MACKEREL, CHUB	192	$110	$0.57
MACKEREL, SPANISH	33,210	$45,379	$1.37
MACKEREL, KING AND CERO	1,656	$2,939	$1.77
MENHADEN, ATLANTIC	4,606	$629	$0.14
MULLET, STRIPED	235	$155	$0.66
OCTOPUS	97	$62	$0.64
OPAH	1,239	$1,884	$1.52
PERCH, WHITE	26,415	$22,746	$0.86
PERCH, YELLOW	39,500	$68,644	$1.74
PLAICE, AMERICAN	4,525	$2,766	$0.61
POLLOCK	797	$525	$0.66
POUT, OCEAN	22,909	$8,090	$0.35
PUFFERS	579	$1,333	$2.30
REDFISH OR OCEAN PERCH	3,172	$3,706	$1.17
ROSEFISH,BLACKBELLY	60	$103	$1.72
RUNNER, BLUE	7	$4	$0.57
SCUPS OR PORGIES	632,274	$905,581	$1.43
SEA BASS, BLACK	134,705	$256,383	$1.91
SEA RAVEN	3,782	$964	$0.25
SEA ROBINS	25,595	$4,614	$0.18
SHAD, AMERICAN	24,581	$7,490	$0.30
SHAD, AMERICAN BUCK	147	$72	$0.49
SHAD, AMERICAN ROE	852	$422	$0.50
SHARK, ATLANTIC ANGEL	86	$280	$3.26
SHARK, BLACK TIP	14	$5	$0.36
SHARK, DUSKY	1,393	$272	$0.20
SHARK, NURSE	132	$132	$1.00
SHARK, PORBEAGLE	266	$219	$0.82
SHARK, SHORTFIN MAKO	18,656	$17,077	$0.92
SHARK, SMOOTH DOGFISH	20,574	$6,304	$0.31
SHARK, SPINY DOGFISH	1,898,467	$359,545	$0.19
SHARK, THRESHER	894	$612	$0.68
SHARK, DOGFISH	2,526	$961	$0.38
SHARK, UNC	2,903	$2,063	$0.71
SILVERSIDES	32,734	$27,664	$0.85
SKATES	794,101	$119,789	$0.15
SMELT, RAINBOW	539	$185	$0.34
SNAILS (CONCHS)	30,126	$21,613	$0.72
SPADEFISHES	4	$3	$0.75
SPOT	579	$354	$0.61
STARFISHES	2	$1	$0.50
SUNFISHES	2,064	$1,238	$0.60
SWORDFISH	218,921	$604,422	$2.76
TAUTOG	38,487	$83,246	$2.16
TILEFISH	889,197	$2,005,811	$2.26

Table 3.3.3.2-1. continued. 2000 Annual Commercial Landings in New York.			
Species	**Pounds**	**Dollars**	**Price/Pound**
TOADFISHES	52	$165	$3.17
TUNA, ALBACORE	63,939	$29,718	$0.46
TUNA, BIGEYE	130,737	$419,447	$3.21
TUNA, BLACKFIN	5	$5	$1.00
TUNA, BLUEFIN	5,482	$25,675	$4.68
TUNA, YELLOWFIN	170,466	$373,665	$2.19
TUNA, UNC	23,889	$55,062	$2.30
WAHOO	672	$1,150	$1.71
WEAKFISH	335,943	$337,386	$1.00
WOLFFISH, ATLANTIC	54	$8	$0.15
FINFISHES,UNC FOR FOOD	29,235	$10,934	$0.37
Total Finfish	**17,490,927**	**$15,907,502**	
CLAM, ATLANTIC JACKKNIFE	77,466	$239,203	$3.09
CLAM, ATLANTIC SURF	5,566,514	$3,601,862	$0.65
CLAM, SOFTSHELL	180,504	$848,361	$4.70
CLAM, QUAHOG	2,349,098	$17,546,728	$7.47
CLAMS OR BIVALVES	1,260	$1,527	$1.21
CRAB, ATLANTIC ROCK	9,755	$4,958	$0.51
CRAB, BLUE	16,054	$11,235	$0.70
CRAB, DEEPSEA RED	27	$12	$0.44
CRAB, JONAH	54,919	$27,983	$0.51
CRAB,UNC	6,318	$3,626	$0.57
HORSESHOE CRAB	53,749	$17,880	$0.33
LOBSTER, AMERICAN	2,991,331	$11,986,549	$4.00
MANTIS SHRIMPS	624	$640	$1.03
MUSSEL, ~~BLUE~~	1,062	$1,241	$1.17
OYSTER, EASTERN	149,520	$1,310,996	$8.77
PERIWINKLES	65	$33	$0.51
SCALLOP, BAY	3,682	$55,656	$15.12
SCALLOP, SEA	102,843	$228,692	$2.22
SHRIMP, BROWN	4	$10	$2.50
SHRIMP, OTHER	3	$5	$1.67
SQUID, LONGFIN	12,104,033	$7,688,089	$0.64
Total Shellfish	**23,668,831**	**$43,575,286.00**	
TOTAL FISHERY LANDINGS	41,159,758	$59,482,788	

Source: National Marine Fisheries Division. Fisheries Statistics Division. 2001

Table 3.3.3.2-2. 2000 Annual Commercial Landings in Connecticut.			
Species	**Pounds**	**Dollars**	**Price/Pound**
ALEWIFE	77,985	$4,680	$0.06
BLUEFISH	33,452	$14,001	$0.42
BONITO, ATLANTIC	235	$87	$0.37
BUTTERFISH	142,858	$72,860	$0.51
COD, ATLANTIC	79,668	$82,544	$1.04
CONGER EEL	1,276	$493	$0.39
CUSK	167	$54	$0.32
DOLPHIN	30	$53	$1.77
DORY, AMERICAN JOHN	305	$127	$0.42
FINFISHES, UNC BAIT AND ANIMAL FOOD	3,298	$330	$0.10
FINFISHES, UNC GENERAL	9,393	$3,536	$0.37
FLATFISH	62	$31	$0.50
FLOUNDER, SUMMER	245,148	$643,630	$2.63
FLOUNDER, WINDOWPANE	20,945	$4,850	$0.23
FLOUNDER, WINTER	445,239	$383,356	$0.86
FLOUNDER, WITCH	45,338	$47,756	$1.05
FLOUNDER, YELLOWTAIL	228,501	$186,695	$0.82
GOOSEFISH	1,543,633	$1,556,274	$1.00
HADDOCK	9,250	$10,649	$1.15
HAKE, RED	381,092	$101,003	$0.27
HAKE, SILVER	6,201,746	$2,754,699	$0.44
HAKE, WHITE	15,446	$8,676	$0.56
HERRING, ATLANTIC	64,413	$3,222	$0.05
KING WHITING	189	$115	$0.61
LEATHERJACKETS	34	$18	$0.53
MACKEREL, ATLANTIC	40,547	$11,383	$0.28
MENHADEN, ATLANTIC	14,423	$1,444	$0.10
PERCH, WHITE	11,952	$12,060	$1.00
PLAICE, AMERICAN	55,917	$58,438	$1.05
POLLOCK	1,466	$1,806	$1.23
REDFISH OR OCEAN PERCH	180	$87	$0.48
SCUPS OR PORGIES	142,415	$174,523	$1.22
SEA BASS, BLACK	14,637	$26,328	$1.80
SEA ROBINS	10,085	$1,011	$0.10
SHAD, AMERICAN BUCK	7,491	$2,219	$0.30
SHAD, AMERICAN ROE	99,925	$84,519	$0.85
SHAD, GIZZARD	2,749	$275	$0.10
SHARK, DOGFISH	30,131	$5,887	$0.20
SHARKS	87	$118	$1.36
SKATES	1,088,642	$92,943	$0.09
SNAILS (CONCHS)	69,864	$44,510	$0.64
TAUTOG	8,504	$11,504	$1.35
TILEFISH	1,392	$1,977	$1.42
TUNA, ALBACORE	1,515	$1,152	$0.76
TUNA, YELLOWFIN	10,543	$30,375	$2.88
TUNA, UNC	916	$3,586	$3.91

Table 3.3.3.2-2. continued. 2000 Annual Commercial Landings in Connecticut.			
Species	**Pounds**	**Dollars**	**Price/Pound**
WEAKFISH	7,920	$8,497	$1.07
WOLFFISH, ATLANTIC	5,725	$1,406	$0.25
Total Finfish	**11,176,729**	**$6,455,787**	
CLAM, QUAHOG	4,021,008	$9,415,356	$2.34
CRAB, BLUE	1,745	$1,754	$1.00
CRAB, GREEN	36,208	$19,915	$0.55
CRAB, HORSESHOE	67,683	$16,822	$0.25
CRAB, JONAH	16,806	$6,879	$0.41
CRABS	6,697	$2,628	$0.39
LOBSTER, AMERICAN	1,393,565	$5,500,512	$3.95
OYSTER, EASTERN	623,816	$4,839,468	$7.76
SCALLOP, SEA	800,469	$4,033,899	$5.04
SHELLFISH	1,289,247	$786,525	$0.61
SHRIMP, OTHER	44,608	$128,947	$2.89
SQUID, NORTHERN SHORTFIN	84,050	$18,490	$0.22
Total Shellfish	**8,385,902**	**$24,771,195.00**	
TOTAL FISHERY LANDINGS	**19,562,631**	**$31,226,982.00**	

Source: National Marine Fisheries Division, Fisheries Statistics Division, 2001

3.3.4 Ocean Dumping Sites

Open water disposal sites in Long Island Sound have been used for disposal of sediments dredged from harbors and navigation channels in Connecticut, northern Long Island, eastern boroughs of New York, and Westchester County for more than fifty years (Fredette et al. 1992). From the 1950s to 1970s, about 19 disposal sites were active in Long Island Sound (Dames and Moore 1981). Most of these sites were eventually closed and three regional disposal sites were identified by the Interim Plan to support disposal requirements throughout Long Island Sound (NERBC 1980a & b). These three sites are the Central Long Island Sound (CLIS) Disposal Site, the New London Disposal Site (NLDS), and the Cornfield Shoals Disposal Site (CSDS). An additional site identified in the Interim Plan, Eaton's Neck, was closed and replaced by the Western Long Island Sound (WLIS) Disposal Site through an Environmental Impact Statement (EIS).

The proposed pipeline will not cross any area identified on NOAA navigational charts as a designated dumping ground (NOAA 1984, Rossiter 2001). The nearest designated dumping ground is the CLIS, which is maintained by the USACE for disposal of dredged materials, and located approximately 3.5 miles east of the proposed route alignment (NOAA 1984, Rossiter 2001).

3.3.5 Shellfish Franchise Areas/ Aquaculture

The proposed pipeline crosses one leased shellfish bed in Connecticut waters: this bed is off the coast of Milford, and is leased to Fairhaven Clam and Lobster Co. LLC (Lease No. 580). The proposed alignment does not cross any state-leased shellfish beds in New York waters.

4.0 HAZARDS TO CONSTRUCTION AND OPERATION

The hazard survey by Thales GeoSolutions, Inc. provided the results of high-resolution geophysical surveys associated with the proposed ELI Project. Known facilities that will have to be negotiated and considered in design and anchor placement, and fall within the areas surveyed include:

An area of boulders and rock outcrop near Charles Island (Milford, CT), and
Three submarine telecommunications cables.

For most of the area surveyed, the bottom sediments and shallow subsurface soils are unconsolidated clays and sands that should be readily trenched for pipeline protection. Some localized seafloor conditions have been identified from this survey that may require route alignment modifications and/or specialized engineering attention.

The scope of work included geophysical surveys along the proposed ELI Project, which included full coverage swath and single beam bathymetry, sidescan sonar imaging with 100% overlap, and sub-bottom profiler (SBP) to at least a 30-ft penetration. Magnetometer readings were also collected and analyzed to identify any anomalies such as shipwrecks, pipelines, and cable crossings.

4.1 Hazard Survey Results

The sonar data collected by Thales GeoSolutions are excellent for recognizing and plotting significant geological and man-made features. An attempt has been made to characterize surficial sediments using the strength and patterns of the sonar backscatter. This attempt has been reasonably successful when compared to the soils encountered as part of the geo-technical and bio-chemical sampling program. It is likely that some of the backscatter variations reflect other factors than sediment texture, such as the percentage and size of shell material, organic content of the surface sediments and the resulting methane gas, and other factors not yet recognized. Numerous individual lobster traps and strings of traps lie within the proposed pipeline corridor, frequently crossing the proposed route. These features are considered transient and are not considered in the survey results. No ship wrecks or extensive debris fields were encountered during the survey of the proposed pipeline corridor.

The bottom and shallow subsurface sediments over most of the proposed route are generally unconsolidated and include either soft silty clays or fine sand, with clay being the most common. In general, trenching for pipeline installation and protection to depths of at least five feet should not pose a problem over the majority of the proposed route alignment. It is only nearshore, just north of Long Island, that coarser sediment, principally medium-grained sand is encountered, and similarly, trenching in this sediment should not pose any sever difficulties. Firmer sediment, sand silt, is also found near the beginning of the proposed pipeline route.

No ship wrecks were identified during surveys of LIS. Similarly, no extensive manmade debris fields were encountered along the proposed route. There was, however, evidence of an active ground fishery (trawling) located between the Point of Beginning (POB) (MP 0.0) and approximately MP 2.3, but this fishing gear does not apparently penetrate the seafloor more than a few inches and should therefore pose no risk to the construction of the proposed pipeline. South of this fishery area the seafloor is littered with lobster traps, of which most are probably derelict.

The proposed route crosses three telecommunications cables. The first of these cables is an AT&T cable that was identified at approximate MP 7.8. The second cable identified was an MCI cable located at approximate MP 14.0, while the third cable identified was a newly installed cable at approximate MP 10.8.

For a detailed and complete discussion of the Hazard survey conducted for the proposed ELI Project, please refer to the hazard survey report provided in Volume IV.

4.2 Meteorological Hazards

The principal meteorological hazards to construction and operation of the proposed ELI Project include water currents and severe storms and storm waves.

4.2.1 Severe Storms and Storm Waves

Meteorological events that may potentially impact construction and operation of the proposed pipeline include severe storms and hurricanes. There is a high probability that severe storms and hurricanes may cause damage to the physical, biological, and socioeconomic systems of Long Island Sound. Severe storms warrant discussion because such events may affect offshore construction operations and activities such as delaying daily construction effort, increases in safety concerns, and/or lead to the shut down of the entire construction spread, which ultimately causes delays in construction schedules during the passage of inclement weather. Pipeline construction within Long Island Sound needs to consider storm surge, wave height, and currents generated by potential storms and hurricanes (MMS 1990).

Wind and wave magnitude and direction have a direct affect on marine pipeline installation activities. As winds and sea states increase, pipeline operations have to be temporarily interrupted in order to maintain equipment and personnel safety as well as pipeline integrity (Centaur Associates, Inc. 1984). Under more severe conditions, pipe laying activities have to be abandoned altogether. Hurricanes are the leading cause of pipeline failure in oil and gas activities, but such events are rather infrequent. From 1964 to 1992, only two pipeline have been damaged from hurricanes, resulting in the release of more than 1,000 bbls. Due to the pipeline being buried in less than 200 ft of water, hurricanes, severe storms, and high winds have a lower probability of damaging the pipeline and are thus not expected to impact the operation of the proposed pipeline.

Severe storms not only produce high winds, but may also produce large storm waves that may potentially cause damage to the proposed pipeline. Waves cause circulatory currents in the water column, which extend to considerable depths below the water surface. In certain cases, when the waves are high enough and the water shallow enough, the movement of the water could cause the pipeline to move. This would only be possible if the proposed pipeline were exposed on or above the seabed.

4.2.2 Currents

The current regime in Long Island Sound is described in detail in Section 3.1.3 of this BA. During construction, the pipeline may be deflected excessively if it is exposed to strong water currents. The risk of pipeline deflection from currents during construction is only significant in the event of an extreme storm. Several construction techniques may be implemented to avoid damage to the pipeline from this cause.

The pipeline would be provided with a concrete coating to overcome its natural buoyancy. The "negative buoyancy" (net submerged weight) of the pipeline is designed to ensure it does not deflect excessively if impacted by strong bottom currents. The "design storm" is derived by statistical analysis of weather patterns in the specific section of Long Island Sound being considered. The pipeline weight is then chosen to withstand the given storm with an acceptably low probability of occurrence. The fact that the pipeline is only exposed during a period of a few weeks or less lowers the probability of it being affected by an extreme storm.

5.0 POTENTIAL IMPACTS FROM PIPELINE CONSTRUCTION AND OPERATION

This section provides an assessment of the potential impacts that the installation of the ELI pipeline may have on the Long Island Sound environment. The standard types of lay barge construction (dredging, jetting, plowing, and mechanical trenching) that may be utilized for the installation of the pipeline are described in Section 2.3. These types of lay barge construction techniques generally involve similar disturbances to the seabed (linear, depth, temporary) and; therefore, distinctions between construction types are addressed. Construction of the offshore pipeline is scheduled for the winter months to minimize impacts, however construction may, possibly extend into the spring depending upon the actual start date and potential delays during construction. Therefore, impacts discussed in the following section consider spring construction, as well.

5.1 Physical Environment

Recent advances in submarine pipeline technology have resulted in pipeline development in areas of extreme environmental and physical conditions. A preliminary assessment of the physical conditions within Long Island Sound indicates that few, if any, extraordinary situations would arise which would be impacted by the construction and operation of the proposed Eastern Long Island Project. Water depths, sea states, hydrology, and meteorological conditions along the proposed pipeline route do not warrant any new technology. Best industry practices would be employed to minimize and reduce potential impacts to the physical environment of Long Island Sound. In general, Long Island Sound is suitable for pipeline development when considering its geologic and physical characteristics.

5.1.1 Potential Impacts to Geology and Surficial Sediments

It is estimated that installing the pipeline would impact approximately 228.6 acres of the Long Island Sound seafloor. Surficial sediments would be disturbed in areas where the proposed pipeline would be trenched. However, these disturbances are expected to be temporary, and minimal in nature. Trenching would impact sediment in addition to the daily seafloor disturbance caused by anchoring, currents, storms, and trawling from fishing vessels. The length and volume of sediments to be trenched are presented in Table 5.1.1-1.

Table 5.1.1-1. Total estimated lengths, areas, and volumes to be trenched for the proposed ELI Project in Long Island Sound

Location	Length	Width[1]	Area	Volume[2]
Long Island Sound	17.1 miles	100 to 300 feet	228.6	755,865

[1]Width at surface of seafloor.
[2]Volume as been calculated based on estimates of soil conditions only regardless of the type of trenching method used. These estimates are typical for the type of material that will be encountered during construction. Actual total volumes will be dependent on conditions at the time of construction.

Mass movements of sediments can result from pipeline construction. Slumping or sliding of sediments can also result in displacement of or damage to the pipeline. However, mass movements of sediments are usually limited to areas of the continental slope as well as canyons, and canyon heads. Shallow hazard surveys conducted along the proposed pipeline route revealed little or no potential for such geologic effects.

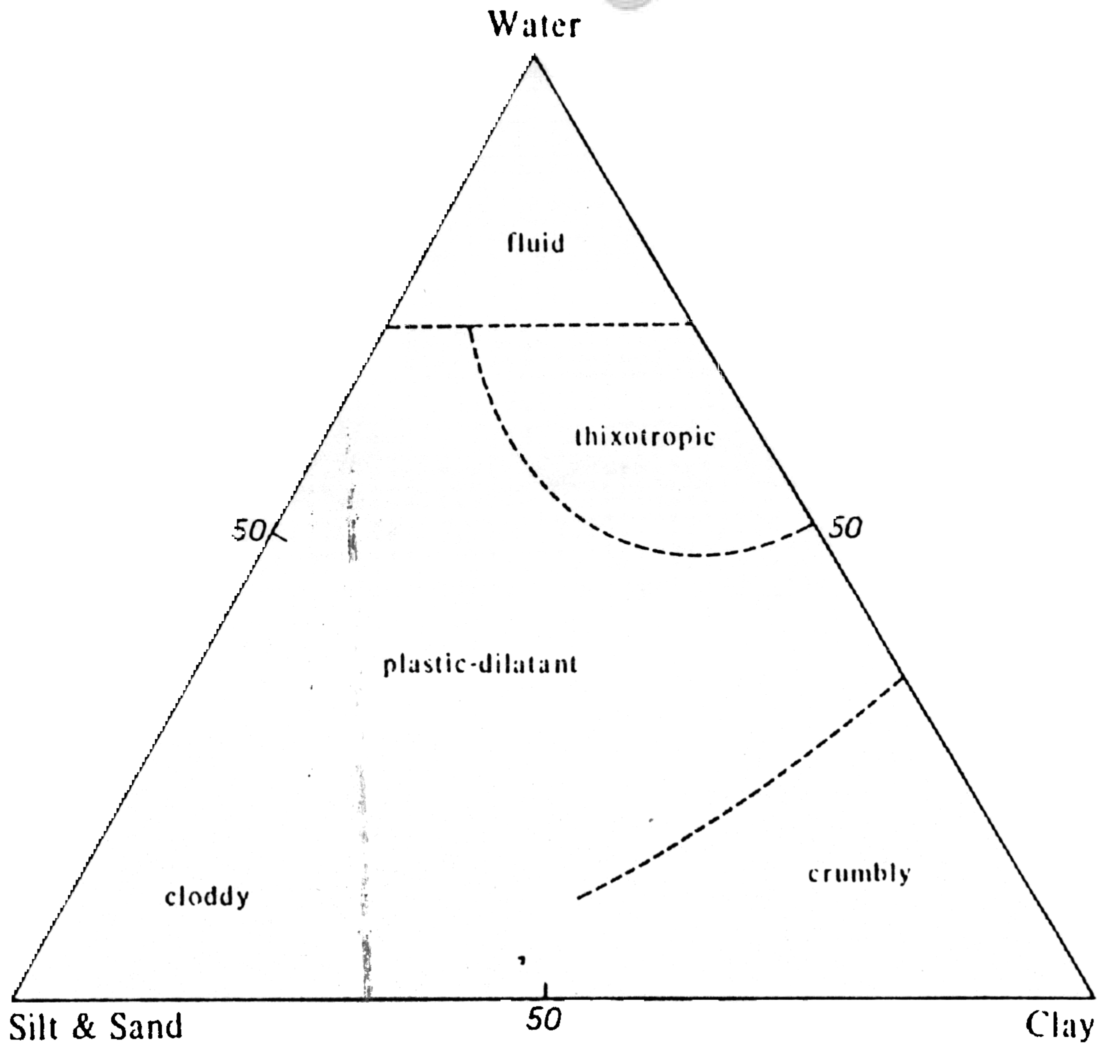
Trenching the pipeline has the immediate effect of excavating and turning over sediment. The impact of this activity would depend on the volume of sediment displaced and the type of sediment being penetrated. Most of the proposed pipeline would be installed in organic silt-clays. The upper 10 cm of these bottom types typically have >50% water and behave geotechnically as thixotropic or quasi-fluid sediments (Boswell 1961; see also Figure 5.1.1-1). Trenching can be expected to locally re-suspend and disperse high-water-content sediment as loose aggregates. At depth, compaction results in less water content (<50%), resulting in plastic-dilatant or cloddy properties. The compacted fraction would be displaced by the turbulence associated with the trenching process ("plucking" erosion). Large mud clasts would accumulate at or near the surface, showing a distinctive boundary roughness. Because these cohesive mud clasts are too large to be re-suspended by mean tidal bottom currents in western Long Island Sound (Knebel et al. 1999), they should be limited in distribution to the nearfield.

Trenching activities on mud-free sandy bottoms would result in the local excavation and dispersal of sand. Mineral sands tend to have relatively high settling velocities (higher Stokes values) than organic-mineral aggregates, and would therefore fall back rapidly onto the bottom when the mean flow drops below a critical entrainment velocity. For very fine, fine, and medium sands (4-3 phi, 3-2 phi, and 2-1 phi, respectively), sand suspended during the pipeline excavation would settle back onto the bottom adjacent to the trenching activity as currents drop below 30 to 50 cps as measured one m above the bed (Allen 1970 and Rhoads et al. 1978). The apron of excavated sand should form a thin flank deposit adjacent to the pipeline trench and have relatively low boundary relief relative to excavated muds.

5.1.2 Potential Impacts to Water Quality

The most significant potential impacts to water quality from pipeline construction are from sediment resuspension/redeposition during trenching for the installation of the pipeline. Coarser sediments suspended in the water column would fall out and resettle quickly, while finer sediments would remain suspended for longer periods of time.

The trenching activities to install the pipeline has the potential to locally effect water quality by causing transient increases in overlying water turbidity, plume dispersal, and resedimentation (see also Section 5.1.3 below). This trenching would result in a local elevation in near-bottom turbidity: 81% of the sediments sampled along the proposed route had >70% silt+clay (Section 3.1.1). The dispersed fraction of organic-mineral aggregates should have settling velocities comparable to ambient aggregates present in the benthic turbidity zone (BTZ) (0.01 to 0.04 cps) (Rhoads et al. 1984). This local plume can be expected to rapidly mix with the ambient particle population in the BTZ and be indistinguishable from background (40-50 mg/l) within one tidal cycle. Because of the water depth and high settling velocities of these aggregates, no sea surface manifestation of this turbidity is expected, especially if trenching takes place during a period of stratification.



LEGEND

Hydromechanical jetting for the Iroquois pipeline can be expected to produce different particle consistencies depending on the degree of mixing of ambient sediments with jetting water. Geotechnical properties of excavated material can be expected to range from quasi-fluid resuspensions to large cohesive mud clasts.

Data Source: Boswell, 1961.

Geotechnical properties of sediments having different contents of water, sand, and clay.

Iroquois GAS TRANSMISSION SYSTEM

ENSR. INTERNATIONAL

SCALE:

FIGURE: 5.1.1-1

The process of excavation and plume generation can be expected to result in the physical turnover of bottom sediments, i.e., exposure of particles and pore-water solutes from anaerobic buried sediment to the aerobic or hypoxic sediment surface. This redistribution of sediment (change in redox conditions) can result in the release of pore-water solutes (reduced metal sulfides and reduced metabolites (e.g., hydrogen sulfide, ammonia, nitrite, nitrate, phosphate, and methane gas)). The excavation process would not change the overall inventories of contaminants, but a change in redox conditions can be expected to change solubilities, flux rates, and rates of aerobic decomposition through enhanced chemical and biological oxidation. For example, when reduced metal sulfides are exposed to aerated (positive redox) conditions, the metals are oxidized and co-precipitated with iron as ferric hydroxides. Manganese released from reduced sediment to an aerated water column is capable of accounting for 30–50% of the benthic oxygen flux (Aller 1994a). Mechanical stirring of muddy sediment, whether by natural bioturbation or mechanical means (alternating oxidation/reduction conditions), accelerates decomposition rates of organic matter (Aller 1994b).

In summary, the local exposure of reduced sediment to the water column (transient plume) and on the bottom is expected to result in enhanced chemical and biological oxygen demand. Once the surface has been reoxidized, rates should converge with the ambient bottom. Dredged material deposits in central and western Long Island Sound have not shown a farfield effect on released contaminants (Rhoads 1994), nor has dissolved oxygen over the bottom been shown to be a problem.

5.1.3 Potential Impacts to Hydrology and Sediment Transport

The impact of installing the gas pipeline should not have long-term impacts to the hydrology of the overlying water column. Increases in the horizontal and vertical flow due to construction can be expected to have only a local and transient effect on water-column structure and near-bottom tidal flow. In Section 5.1.1 above, it was noted that trenching the pipe into muddy sediments is expected to result in mass transport of high water content quasi-fluid muds that have >50% water. Dispersed mud is expected to experience lateral transport when ambient bottom currents (1 m above the bottom) are above 20 cps. Ambient bottom tidal currents in western Long Island Sound approach this value over muddy bottoms and velocities of 30 cps have been mapped for sandy elevations of the bottom (Knebel et al. 1999).

5.2 Biological Environment

Detailed descriptions of the potential impacts to these biological resources identified in Section 3.0 are discussed below.

5.2.1 Essential Fish Habitat

In general, pipeline construction in the offshore waters and resulting impacts to sediment types in EFH are expected to be temporary as natural sedimentation and recolonization of the benthic community is expected to occur rapidly. Demersal and pelagic species and life stages might experience disturbance to EFH due to a need to avoid the project area during construction of the pipeline, but are expected to return to the project area following construction. Due to tidal re-suspension of bottom muds in western Long Island Sound, organisms living here are adapted to relatively high sediment suspensions and since pipeline construction is a transient event, no significant long-term adverse impact of added silt-clay to the ambient concentration is anticipated.

The potential effects on the fishery life stages in EFH are discussed below. and refer to Section 5.2.6 for a discussion on how construction techniques can effect fisheries and the status of fisheries along the proposed route.

Winter Flounder

The greatest potential impact to the winter flounder from this proposed project is associated with pipeline construction and subsequent sedimentation. The sediments re-suspended during construction operations would settle on the seafloor and may bury the demersal eggs of this species. Larvae, juveniles, and adults are motile and would be able to escape from burial. Flounder eggs, along with larvae and spawning adults, are most abundant during the months of April and May in Long Island Sound (NOAA 1994). Pipeline construction is scheduled to take place from the fall through early spring. Construction at this time would have the least impact on the various fisheries. Eggs, larvae, and spawning adults of winter flounder are absent from October through December and are rare in January and February. Juveniles have their lowest abundances from August to December and adults are less abundant from July through October. Construction during the fall, winter, and early spring would have minimal impact to the fishery status of winter flounder, since only the highly motile adult stages would be found along the proposed route during pipeline construction. Juveniles are associated with coastal ponds and eelgrass habitat that is not found along the proposed pipeline route and any adults in the area of construction will be able to escape from sedimentation and disturbance caused by pipeline construction. Construction after early spring would result in impacts to sedentary eggs, spawning adults, and larvae in the immediate trench area of pipeline construction. However, when compared to the area of Long Island Sound, the potential impact area from construction is expected to be minimal.

Windowpane Flounder

The demersal eggs of windowpane flounder are susceptible to burial by sedimentation caused by construction in the same manner as winter flounder eggs. The ideal time to place the pipeline to protect this fishery would be fall and winter, with January being the optimal month, as it is for winter flounder. Larvae of this species are not abundant in Long Island Sound, as both windowpane and winter flounder juveniles prefer nearshore, coastal habitats and are often found within eelgrass beds. Spawning adults and eggs are rarely found during the fall. There are no eelgrass beds near the pipeline route. The pipeline is scheduled for installation during the fall, winter, and early spring, which would have the least impact on fisheries for either species of flounder.

Scup

The eggs of this species are planktic and therefore would not be affected by construction and sedimentation produced by the placement of the ELI pipeline. Lifestages of this species are not found in Long Island Sound from November through May. Scup juveniles and adults are highly abundant during October and November, however, these stages are motile and can avoid areas of pipeline construction. The best placement time for this species would be from fall through early spring. Placement of the ELI pipeline during this timeframe should have no long-term impact on the status of this fishery.

King Mackerel

This species prefers warmer waters and because of this preference, it is likely to be abundant in Long Island Sound only during the summer months. If the pipeline is installed from the fall through early spring, there should be no impact on the status of this fishery.

Spanish Mackerel

The pipeline should have no affect on the status of this fishery if it is placed between the fall through early spring. Adults are found year round. but have their greatest abundances during late spring and the eggs. larvae. and juveniles of mackerel are not present in Long Island Sound until the late summer months. It is also important to note that the eggs of Spanish mackerel are pelagic. implying that they would not be affected by pipeline construction and the resulting sedimentation.

Cobia

Pipeline construction may have a limited affect on the adult stage of this species because cobia are demersal much like cod, pollock, and haddock. There is the potential for an adult to become trapped under the pipeline: however. this is highly unlikely because adults are large. motile. and predatory. Eggs and larvae are planktic and would not be subjected to burial resulting from sedimentation caused by the pipeline construction. This species is considered of minor commercial value and installation of the ELI pipeline should not affect the status of this fishery in Long Island Sound.

Red Hake

Red Hake adults and juveniles have their greatest abundances from March through November, with a peak in abundance in May, June, and November. If pipeline construction were to take place from the fall through early spring, there would be little impact on any life stage of this species. Adults and juveniles are motile and would avoid the area. Eggs, larvae, and spawning adults are not found in Long Island Sound and therefore placement of this pipeline should have no affect on these stages or on the status of this fishery.

Atlantic Mackerel

It is possible that a few adults of this species may suffer mortality during pipeline construction since motile adults and juveniles can be found in the three blocks traversed by the pipeline route. Spawning adults and eggs of Atlantic mackerel do not occur in Long Island Sound; these stages should be unaffected by pipeline construction and therefore the status of this fishery in Long Island Sound should not be affected. The only life stages of Atlantic mackerel that are found in Long Island Sound, from the fall through early spring, are adults and juveniles. Construction of the pipeline in the fall, winter, and early spring is the best option for this species. Extending construction into late spring has greater risk of affecting the Atlantic mackerel population, since this is the time when spawning adults, adults, juveniles, larvae, and eggs can be found in Long Island Sound.

Atlantic Sea Herring

Eggs of this species are not present in any of the three blocks that would be traversed by the ELI Pipeline. Spawning adults are also not present in any of the three blocks (NOAA 1994). Larvae are considered rare in Long Island Sound in general. These fish school and a large school would avoid areas of disturbance such as pipeline construction. The only two stages of Atlantic herring that are found in moderate abundance are the juveniles and adults. Adult abundance increases slightly from November to May, but juveniles have the same relative low abundance year round. The life stages of this species that are present in Long Island Sound are never highly abundant (NOAA 1994) and thus construction of the pipeline from the fall through early spring should not affect the status of this fishery.

Pollock

Since the pipeline is expected to be placed in the fall through early spring, the majority of pollock would be in offshore, deeper waters during construction activities. This species is rarely found in Long Island Sound and since the adults and juveniles are motile, they have the ability to avoid areas of disturbance caused by pipeline construction. The eggs and larvae are not found in Long Island Sound and, therefore, should not be affected by the placement of the ELI pipeline. The pipeline construction is not expected to affect any life stages of these fish or its fishery status.

Bluefish

Only adults and juveniles of bluefish are found among the three blocks traversed by the proposed ELI Project. Eggs and larvae are absent from all three blocks. Bluefish individuals are aggressive predators and usually avoid areas associated with disturbance. This species has its greatest abundances in Long Island Sound during the summer when it is fished recreationally. Pipeline placement would take place in the fall, winter, and early spring, thereby avoiding the risk of affecting the status of this fishery. Since neither the eggs nor larvae are found in Long Island Sound and the pipeline will be constructed from fall through early spring, the placement of this pipeline should not have an affect on the status of this fishery.

Atlantic Butterfish

This species is not found in Long Island Sound during the months of January through May. Butterfish are highly abundant as juveniles and adults, in Long Island Sound, from June through October. At the end of October, butterfish move offshore and the abundance of adults and juveniles decreases significantly (NOAA 1994). Since none of the life stages of butterfish are present in Long Island Sound during the fall and winter and only the juveniles and adults are found in October and November, the best time to place the pipeline for this species is from January-May. ELI pipeline construction will take place from the fall through early spring, when the abundance of butterfish starts declining. If the pipeline is placed during the fall through early spring, it would have little affect on the butterfish population and is not expected to affect the status of this fishery.

Atlantic Salmon

The Atlantic cod and Atlantic salmon fishery should not be affected by placement of the pipeline. These species are considered to be rare in Long Island Sound (NOAA 1994). Cod adults and juveniles are highly mobile and predatory and when present, they are found in low abundances. It is important to note that seven small, coastal drainages located in the Downeast and midcoast sections of Maine hold the last remaining populations of Atlantic Salmon in the United States (NOAA 1998d). The USFWS and NMFS have determined that these rivers represent one distinct population segment (DPS). This pipeline should not affect the status of this last remaining historical population of native Atlantic salmon.

Sand Tiger Shark

Only larvae of the sand tiger shark are found, and only rarely, in the three blocks traversed by the proposed pipeline route. This species of shark produces live young at birth and thus does not produce external fertilized eggs. Adults or spawning adults have not been reported (NOAA 1999) from these areas. The pipeline construction should have no affect on any of life stages of this species.

Sandbar Shark

Sandbar sharks are listed as a vulnerable species and therefore there is no current fishery. Most of these sharks are caught as by-catch. This species does not have external fertilization and does not release either planktic or dermersal eggs that could potentially be affected by construction associated with pipeline construction. Only larvae have been reported from Long Island Sound, and then only from limited areas. The placement of the pipeline during the fall, winter, and early spring months should have no affect on the status of this population.

Monkfish

Only juveniles and adults of this species are reported from block 44, a block that is near the pipeline route but will not be traversed. Monkfish spawn during March through June and are rarely found in Long Island Sound. Monkfish prefer the deeper continental shelf waters on the Atlantic side of Long Island. Since juveniles and adults of this species have only been reported from block 44, placement of the pipeline should not affect the status of this fishery or any of its life stages.

Dusky Shark

This is an endangered species that gives birth to live young. It is found in coastal waters at depths of 200 to 400 m, but young can be found in shallower waters (Bass et al. 1986). This shark migrates seasonally over parts of its range (Last and Stevens 1994). It feeds on bottom and pelagic bony fish, sharks, skates, rays, cephalopods, gastropods, crustaceans, sometimes mammalian carrion and inorganic objects. Since this species bears live young, has internal fertilization, and adults live in waters deeper than the area of the pipeline, there is little likelihood that pipeline construction will cause any mortality to this species. This species should not be fished as it is endangered.

Summer Flounder

All life stage of this species are rare in Long Island Sound and most of the pipeline is within habitat that is not preferred by this species. Pipeline construction should therefore have little or no affect on the life stages of this fish or the status of this fishery in Long Island Sound. Several species of fish commonly found in Long Island Sound but not in the three blocks of concern to this project (NOAA 1999). It is remotely possible that individuals of these species would have an incidental occurrence in one of the three blocks traversed by the proposed pipeline route. Regardless of species, if the pipeline is installed between the fall through early spring, it should have minimal to no effect on the status of any fish population found in Long Island Sound.

White Perch

White and yellow perch are not a major fishery in Long Island Sound. These fish are more important as recreational game fish. They are highly abundant during the summer. Only the adults and juveniles are found from October through March. Spawning adults, larvae, and eggs are not found in Long Island Sound during the fall, winter, and early spring months. The pipeline should be placed from the fall through spring in order to make certain that there is minimal impact on the various life stages of these species.

Striped Bass

These two species are important primarily as game fish in Long Island Sound. These fish are only present in Long Island Sound as adults and juveniles and black sea bass are rare. Both fish are found in their greatest abundances in the summer. Therefore, placement of the pipeline between the fall through early spring should have no effect on the life stages of these species.

Rainbow Smelt, Tautog, Blueback Herring, Channel Catfish, and Cunner

All life stages of these fish are found in Long Island Sound; however, spawning adults, juveniles, larvae, and eggs are either rare or absent during the fall through early spring. If the pipeline is installed during the fall through early spring, neither any of the life stages of these species of fish, nor the status of any of these fisheries, should be affected.

Alewife, Bay Anchovy, Atlantic Menhaden, and American Shad

Alewife and bay anchovy have adults and juveniles present in central and eastern Long Island Sound throughout the year but do not have any other life stage present during the winter months. Both fish species have their greatest abundances in Long Island Sound during the summer. Atlantic menhaden have no life history stage present during January and February. American shad are also most abundant in Long Island Sound during summer, but have moderate abundances of juveniles present year round. Since each of these fish has their lowest abundances in the fall and winter months, placement of the pipeline during the fall through early spring shoud not affect any life stage of these species or their fisheries.

5.2.2 Significant Coastal Fish and Wildlife Habitats

The ELI Project does not cross or is located near any NYSDOS Significant Coastal Fish and Wildlife Habitats in the Long Island Sound and; therefore, no impacts to this habitat are anticipated.

5.2.3 USFWS Northeast Coastal Studies Area

The ELI Project does not cross or is located near any USFWS Northeast Coastal Study Areas in the Long Island Sound and; therefore, no impacts to this habitat are anticipated.

5.2.4 Plankton

Research indicates that engineering activities such as dredging have little or no measurable effect on primary producers (O'Connor and Sherk 1976). Effects on phytoplankton production, all of which were concluded to be temporary and limited in extent, were generally restricted to relatively shallow waters and were associated with large-scale projects such as channel dredging or maintenance (Ingle 1952; Odum and Wilson 1962; Kaplan *et.* al. 1974). In the deeper areas of the Long Island Sound, where the majority of the proposed pipeline would be placed, potential negative impacts are unlikely.

In general, studies to document the effects of suspended sediments on zooplankton have concluded that there is little or no measurable impact due to dredging (Sherk *et* al. 1974). This lack of impact was related to the rapid settling of resuspended particulates (O'Connor and Sherk 1976), which had been predicted to reduce feeding efficiency due to clogging of feeding appendages, or to cause physical harm due to abrasion. Any mortality experienced by plankton should be rapidly offset by the high reproductive rates of these organisms.

5.2.5 Benthic Environment

The major benthic impact to be anticipated from the installation of the pipe in the bottom is short-term burial of benthic and demersal species. Mobile organisms such as crabs, lobsters, and bottom fish are capable of moving away from high-turbidity sites that are experiencing elevated sedimentation rates. Less-mobile species such as bivalves, polychaete worms, and amphipod crustaceans are more susceptible to sedimentation.

The biological impact of rapid sedimentation from either natural process (storms) or human activities (pipeline construction) vary from negligible to total mortality depending on the accumulation, temperature, and species experiencing burial. Laboratory studies indicate that most organisms can only survive burial to a depth of 10 cm or less while some invertabrates can survive burial in muds up to 20 cm deep (Kranz 1974, Nichols et al. 1978, and Maurer et al. 1978). Shallower burial of benthos is usually accompanied by an "escape" response with buried populations burrowing upward to the new sediment-water interface to re-establish their life positions. Studies have shown that re-colonization of deposited dredged materials at the Western Long Island Disposal site is very rapid and organism-sediment relations converge with the ambient within one to two years (Carey and Rhoads 1998).

Transient increases in turbidity related to dispersal of silt-clay in the water column have the potential for causing clogging of gills and/or feeding mechanisms of demersal fish and bivalves (e.g., oysters). Because pipeline construction is a transient event, no significant long-term adverse impact of added silt-clay to the ambient concentration is anticipated.

5.2.6 Fish, Shellfish and Lobsters

It is expected that impacts to fish and shellfish species would be negligible. Potential effects on fish and shellfish species from activities associated with construction and operation of the proposed pipeline may come from temporary, localized, lowered water quality due to trenching or emplacement of pipelines, or coastal habitat degradation. Many finfish, shellfish, pelagic and demersal fish species are estuary dependent, and because of this, any coastal environmental degradation resulting from the proposed pipeline construction, although indirect, would have the potential to adversely affect these species. However, the location of the proposed project is entirely offshore, thus, no coastal areas (vegetated tidal wetlands, bays) would be impacted during the completion of this project. For additional information on impacts from the proposed pipeline construction on the habitats of adult demersal and pelagic finfish and shellfish, refer to Section 3.2.1 (Essential Fish Habitat).

5.2.6.1 Fisheries

The disturbance of bottom habitat has the potential to adversely affect the commercial and recreational fisheries of Long Island Sound. Physical disturbance of the benthos by trenching for pipeline placement results in an increase in turbidity that is caused by the resuspension of sediment and its associated contaminants. Disturbance may also cause habitat degradation of some of the benthic community. Degradation or improvement of environmental conditions causing shifts in benthic invertebrate populations may cause shifts in the prey selection and eating habits of the winter flounder and other demersal species. If the disturbance caused by construction does not create settlement of >10 cm, then the motile benthic community should not be affected (Kranz 1974; Nichols et al. 1978; Maurer et al. 1978; Carey and Rhoads 1998).

The finfish that are most likely to be impacted by pipeline construction are demersal fish. Two demersal species commonly found in Long Island Sound are winter flounder and windowpane flounder and both are commonly found along the proposed pipeline route. These two species are among the most abundant finfish species caught by recreational anglers (NOAA 1994 and 1999, CTDEP 1997). Flounder eggs are demersal and therefore likely to be covered in localized areas by sediments during pipeline construction. Recovery is variable dependent on habitat, life history strategy of the particular species, and level of disturbance (NEFMC 1998). Rhoads and Germano (1986) demonstrated that disturbed benthic communities can completely recover in two years.

A description of the techniques to be used for the ELI Project is described in Volume II – Resource Report 1. Of the construction types being considered, Iroquois is proposing to use plowing and mechanical dredging (near shore) to install the pipeline in Long Island Sound. Iroquois proposes to use plowing techniques to install the pipeline below the bottom where conditions allow. This will minimize the impacts to the benthic environment by limiting the disturbance and resulting sediment plume generally observed from other construction techniques. However, plowing is limited to site-specific conditions encountered along the route and other construction techniques may be required including jetting/trenching to install the pipeline. Which construction techniques will be employed in what areas along the route will be a function of permit conditions and approvals and site specific conditions. Iroquois will discuss which construction methods are appropriate and in what areas during the permitting process with federal and state agencies.

Because plowing is the preferred installation method by the CTDEP and NYSDEC based on the limited disturbance to the bottom from this method, plowing is not discussed in detail with respect to impacts on fishery resources. The NYSDEC has also determined that sediment dispersion modeling is not needed because of the relatively minor re-suspension associated with plowing and , therefore, this analysis has not been completed for this report.

Alternative methods of construction to plowing may be necessary based on site conditions. How these alternative construction methods may affect fish and the status of fisheries along the proposed pipeline route are described below.

Blasting

Although unlikely, blasting may occur at areas where there is consolidated bedrock or large boulders. Based on the findings of Teleki and Chamberlain (1978), the more rapid the detonation velocity the more abrupt the resultant hydraulic pressure gradient would be and therefore, the more difficulty fish would have adjusting to pressure changes. Hubbs and Rechnitzer (1952) found that fish were immune to slowly detonating black powder and were able to withstand pressures of 854-1103 kPa. High explosives lowered the lethal range to 30-150 kPa. Common injuries include hemorrhaging in the coelomic or pericardial cavity and swim-bladder ruptures. Differences in species-specific susceptibility to blast injuries are a function of the fish's shape and swim-bladder formation. All physoclistic fish (laterally compressed bodies) were the most sensitive to the blasts. Flounder are a physoclistic fish, as they have a larger surface-area-to-volume ratio. Flounder species do have pericardial and coelomic cavities but they do not have air bladders, which makes them less susceptible than other physoclistic fish to blasting injuries. However, constructing the pipeline in the fall through early spring would be optimal as this is a time when all fish found in the proposed pipeline route are least abundant, including all species of flounder.

The minor amount of blasting that may result from pipeline installment limits the significance of this effect. If blasting does occur, the degree of fish injury would be related directly to the size of charge used and the existence of an air bladder within any fish present. Specifications for blasting are inherently site-specific. Species such as herring, striped bass, and anchovy have air bladders, but flatfishes such as winter flounder or windowpane flounder, which are common in Long Island Sound, do not and therefore are less vulnerable to submerged blasting. By undertaking construction during the winter, fewer fish would be vulnerable. The effect of underwater explosions on clams, crabs, oysters, and other invertebrate animals seems to be very small except in the immediate vicinity (NYPA 1987). For an explosion below the bottom surface, damage could occur to nearby organisms buried in the sediment. Blasting does create additional surface area to which invertebrates could attach and voided space for predator evasion. It is possible that the minimal amount of blasting that may be necessary could be beneficial to marine benthic invertebrates and fishes by creating additional habitat.

Jetting

With hydraulic jetting, physical disturbance of bottom sediments would result from the hydro-mechanical action of the jetting equipment including the narrow fluidizing apparatus which allows the pipeline to settle under its own weight to a typical depth of approximately 3 feet to top of pipe (NYPA 1987). The dimensions of the plume resulting from the installation disturbances would depend on the sizes of the sediments displaced and near-bottom currents. The small sizes of sediments that characterize much of the route for the preferred placement, i.e. silt and clay, would tend to delay settlement somewhat, allowing currents to disperse the particles beyond the immediate vicinity of the trench. However, because the fluidizing would occur below the sediment-water interface, any of the disturbed sediments would remain contained within the sediment.

The water quality effects of jetting include turbidity, mobilization of chemicals, and sedimentation; although, no long-term impacts to biota are expected. A study for the Long Island Sound Cable Project in 1987 found that the survivorship for tested fish and invertebrates was high during 96-hour bioassays using sediment taken from their transect between Great Neck and the Hutchinson River (NYPA 1987). The demersal fish and benthic invertebrates, which would encounter suspended sediments from jetting, contend with natural turbid conditions routinely. In addition, mobile organisms could avoid the equipment and areas of suspended sediments. It was determined that motile benthic organisms are able to escape from suffocation if total sedimentation is 10 cm or less (Kranz 1974, Nichols et al. 1978, Maurer et al. 1978). Greater accumulations of sediments can cause mortality, although the benthic community would re-colonize the corridor. The recolonization of deposited dredged materials at the Western Long Island Disposal site is very rapid and organism-sediment relations converge with the ambient within one to two years (Carey and Rhoads 1998).

Mechanical Dredging

The water quality effects of dredging are similar to those of jetting. A nearshore turbidity plume would be expected to develop during dredging, however, since the nearshore habitats are comprised of sandy sediment, the particles in the plume would settle out very rapidly. Since contaminants bind to fine particles (silt and clay) the sandy, gravelly sediment in the nearshore habitats is relatively clean. Therefore, there is no need to consider the affects of contaminated sediment on the benthic nearshore fauna (ENSR 2000). Studies at disposal sites have shown that recolonization of deposited dredged materials is very rapid (Carey and Rhoads 1998). Large, motile vertebrates, such as winter flounder, would most likely avoid the area. Dredge disposal is not anticipated.

Most studies have shown that small-disturbance events, even when frequent, are either masked by the background of large-scale disturbances, or that the scale of disturbance is small enough to allow rapid recolonization, such that large-scale effects never become apparent (ENSR 2000a). Physical disturbance of the seabed by bottom trawling fishing vessels may exceed a threshold scale (i.e. large-scale) at which lasting ecological effects may occur, even against background natural disturbance. Bottom fishing is one of the most widespread sources of anthropogenic disturbance to seabed communities. The most profitable fisheries in Long Island Sound are for groundfish, specifically, winter and windowpane flounder. Trawling disturbance can lead to long term changes in benthic community structure, particularly as it might generate species or size specific mortality with a different profile to natural disturbance (Kaiser et al. 1998). However, as bottom fishing has been going on in Long Island Sound, long-term impacts to fisheries are not apparent, as the industry has continued despite the potential for large-scale impact. This repeated event has a far greater impact potential than any one-time disturbance that could be caused by the proposed construction of the ELI Project. The one-time disturbance of the sediments from dredging will have no long-term effects to the benthic community associated with the proposed route, and far less than the repeated efforts of trawling caused by fishing vessels in Long Island Sound.

5.2.2.2 Shellfish

Shellfish are particularly vulnerable to potential impacts from pipeline construction due to their sedentary nature. Organisms (shellfish) within the area that would be trenched for pipeline installation would be lost. Shellfish mortality could occur in areas adjacent to the proposed pipeline through suffocation due to the increased turbidity from trenching. Furthermore, siltation during and subsequent to the trenching of the pipeline could alter sediment structure, possibly making it unsuitable for the settling and attachment of shellfish larvae.

Some studies (Davis 1960; Davis and Hidu 1969) have documented significantly reduced development rates and increased mortality for mollusk larvae when treated with small increases in suspended particles. Brosius et al. (1983) concluded that this impact is probably more significant in areas with fine-grained sediments as opposed to sands. A pre-existing accumulation of heavy metals may also be re-suspended upon trenching of the proposed pipeline; these metals would oxidize when resuspended and form compounds with sediment particles. Such compounds would settle rapidly to the bottom due to their increased molecular weight and not become available for biological uptake. Concentrations of several metals at stations in both Connecticut and New York waters exceeded ER-L values, but these exceedances were, for the most part, very slight and none exceeded ER-M values.

Brosius et al. (1983) concluded in their evaluation of pipeline construction that any impacts on shellfish populations would be minimal due to the extensive nature of most shellfish beds and populations. However, they cautioned that care should be taken in areas of high shellfish density and suggested that construction should take place in non-spawning months (September through March) to minimize such impacts on shellfish species.

5.2.2.3 Lobsters

Impacts to benthic fishery resources would result primarily during the construction process. Animals on the sediment surface under the pipe itself as it is laid could be impacted. The construction process could produce a low plume of suspended sediment particles that would impact an area around the pipe; however, over time, natural processes would infill the trench created around the pipe.

Whether this sequence of events would impact the lobster populations and ultimately the fishery in the area would depend on which life history stage of the lobster is potentially affected. Larval lobsters may be in the water column during the months of May through August, but it is unlikely that construction would take place during this time period; therefore, larval stage lobsters should not be affected.

Early benthic phase (EBP) lobsters are restricted to their chosen shelters for a period of up to two years. If any lobsters of this stage were present in the construction path, they could be damaged because they may not be able to avoid the pipe or construction activities. If damaged but not killed by the process, they would be vulnerable to disease and predation and less likely to survive than individuals that were not disturbed. If EBP young-of-the-year lobsters are destroyed, the fishery would be affected 5–7 years later. However, it is highly unlikely that any EBP lobsters are present along the proposed pipeline route.

Sediment composition was analyzed at several stations along the proposed route, and the majority of locations were shown to have fine sediments consisting of a high percentage of silt and clay. EBP lobsters are not attracted to this sediment type where they would be more exposed to predators (Lawton and Lavalli 1995; Lavalli, pers. comm). Review of the literature by Stern and Stickle, and studies—by Peddicord and McFarland (1978) concluded that most aquatic organisms—including juvenile lobsters are not seriously affected by temporary exposure to increased suspended solids (USACE 1991).

Adult lobster exhibit molting peaks in late spring (May/June) and fall (November). During these periods the animals are more sensitive to disturbances and their physiological oxygen demand is greater (Estrella, pers. comm.). A study of the effects of bottom trawling on American lobsters in Long Island Sound addressed the potential for delayed mortality of lobsters less than the legal catch size due to damage incurred during the process of being caught and subsequently returned to the water (Smith and Howell 1987). The study found that damage was not always lethal; that visibly undamaged lobsters almost never suffered delayed mortality; and that damage and mortality occurred more frequently to lobsters that were molting. From this perspective, in order to avoid impacting lobsters during molting periods, late fall and winter would be the preferred time frame for construction activities. If the construction period began in the fall, there would be an increased risk of impacting molting lobsters hiding in coarse-grained gravelly areas along the pipeline route, since this is the second of two seasonal molting peaks. Assuming that most of the construction will take place during winter, and considering that the sediment along the pipeline route is predominantly comprised of fine-grain sediments, the likelihood of impacting this fishery is negligible.

Adult lobster are mobile, and although they select and occupy permanent shelters, they are capable of long-range movements. Although very small lobster could not dig themselves out if buried by construction debris, larger lobster would probably move out of the area and avoid either being buried or having their gills clogged with suspended sediment. Lobster have been documented as moving out of the path of hurricanes, probably in response to changes in temperature and salinity or even turbidity (Jury *et al.* 1995). Discussions with acknowledged experts on lobster ecology and behavior confirmed the opinion that adult lobster could and probably would move out of the way of the pipe-laying equipment (Estrella, pers. comm; Lavalli, pers. comm.).

When the pipe has been laid, it would create an area of low or irregular relief until natural processes fill in the trench. To the extent that additional texture may be added to the sea floor in this area, the pipe and surrounding disturbed sediment may prove to be attractive to both juvenile and adult lobster. Monitoring of dredged material disposal sites in Long Island Sound has shown that locations previously used for disposal sites became lobster fishing grounds (DAMOS 1985). The bottom relief created by dumping consolidated material apparently created bottom habitats favored by lobsters. The preferences that lobsters demonstrate for rocky and/or irregular habitats are confirmed by the use of artificial reefs to provide lobster habitat (Scarrat 1968; Briggs and Zawacki 1974). The net change to the lobster fishery due to laying the pipeline may therefore be positive rather than detrimental.

5.2.7 Migratory Birds

Although there would be temporary disturbance from construction activities on potential foraging habitats, most migratory species are expected to simply avoid these areas. Trenching would alter the water quality, suspending sediments in the water column in the immediate area, temporarily displacing and/or removing potential avian prey sources. These impacts are expected to be short-term and minor given the proportion of available habitat that would be disturbed and the mobile nature of the construction. The petroleum releases that could directly affect birds by oiling feathers, or indirectly through contamination of food sources or landfall of oil with the subsequent fouling of nesting beaches are not expected to occur because the proposed pipeline would transport natural gas with no significant amounts of condensate or other liquids. The only conceivable release of liquid petroleum from construction of the proposed pipeline would therefore appear to be small and relatively minor releases of vessel fuel, oil, or lubricants by accidental spills or deck drainage. These spills would be expected to dissipate quickly in surrounding waters.

Construction activities are not expected to significantly impact wintering species such as migratory shorebirds. Temporary and minor impacts to their behavior at foraging and resting habitats from increased vessel traffic and trenching of the pipeline may result in temporary avoidance of these sites. However, these species are expected to return to these locations and resume normal activities after construction is complete, and sediments resettle. These disturbances would not occur during the nesting season when birds are most vulnerable, since the pipeline will be constructed offshore and during the fall, winter, and early spring.

5.2.8 Threatened and Endangered Species

The potential for impacts to particular threatened and endangered species is addressed below, where possible. Potential impacts to threatened and endangered species may arise from petroleum spills, disturbance of sensitive habitats, disturbance of important activities such as feeding, breeding, or nursing, or with vessel collisions (Brosius et al. 1983).

Potential impacts resulting form the general construction and operation of the proposed project may include activities that disturb habitat or behavior or could cause mortality of protected species. However, because the distribution of federal and state listed species is generally limited and population numbers low, any impact (direct or indirect) may potentially affect the size, stability, and viability of such populations. Availability of suitable habitat is generally believed to be the most important factor limiting the distribution of many endangered sand threatened species.

A major consideration in assessing potential impacts of the proposed action on protected species is timing of the project construction in relation to the seasonal occurrence of the species in question. The proposed ELI Project will contain one construction spread, which is expected to work in the fall and winter months. The potential for project-related impacts to the protected species above are discussed in detail below.

5.2.8.1 Marine Turtles

Most discussions of potential impacts to endangered sea turtles from oil and gas activities have concerned the possibility of releases of oil (Brosius et al. 1983; MMS 1998). Sea turtles are presumed to be impacted by such releases, either directly, by oiling of the turtle or their eggs, or indirectly, through contamination of their food source. Sea turtles may become oiled by surfacing for air within the oil slick with subsequent fouling and possible suffocation, or by landfall of the oil spill with subsequent fouling of nesting beaches. Sea turtles could also presumably ingest the oil by either feeding on oiled prey items or by instinctive biting at floating tar balls from weathered spills (Brosius et al. 1983). Iroquois would transport only processed, market-ready natural gas. Therefore, the potential impacts associated with oil spills are non-existent. The only conceivable release of liquid petroleum from construction of the proposed pipeline would therefore appear to be small and relatively minor releases of vessel fuel oil or lubricants by accidental spills, deck drainage, or vessel accidents. Although minor releases of vessel fuel or lubricants may occur, impacts associated with this release are expected to dissipate quickly in surrounding waters and that such releases are considered minor and sublethal.

Other less serious and less definable potential impacts to sea turtles from pipeline construction have been suggested. Brosius et al. (1983) evaluated the potential impacts of proposed pipeline construction in the Mid-Atlantic Region of the OCS, and concluded that the primary impact would be the disturbance of sea turtle feeding activities and feeding areas. This disturbance would presumably be due to increased vessel traffic, and more importantly, the trenching associated with pipeline installation. Trenching would temporarily remove any potential sea turtle prey items from the immediate area and suspend large volumes of sediment in the water. Suspension of sediment volumes could temporarily deplete the down current area of sea turtle prey items (i.e. jellyfish, seagrasses, and crabs). As suspended sediments are re-deposited on the seafloor down current, there may be additional mortality or dispersal of sea turtles prey items. These impacts are expected to be short-term and minimal, given the proportion of available habitat that would be impacted. Sea turtles may be temporarily displaced from construction areas but would be expected to return to these areas after the pipeline has been installed and sediments are re-deposited. Brosius et al. (1983) believed that sea turtles would simply avoid construction areas, but concluded that this avoidance would not constitute or result in a major disruption of important behavioral patterns (e.g feeding).

Construction of the marine portion of the proposed ELI is scheduled to occur in the winter months. Marine turtles are most commonly found in the coastal waters of New York and Long Island Sound during the warmer months of the year (June through November). Construction disturbances associated with the proposed project, including short-term elevation of noise levels, sediment re-suspension, reduced dissolved oxygen concentrations, and water quality disturbances, are not anticipated to adversely impact the four marine turtles known to occur and that potentially may occur in the construction area because the proposed in-water construction will occur at a time when few, if any, marine turtles are likely to be present. The possibility of turtles ingesting petroleum products or entanglement in plastics is also possible impacts that could occur to marine turtles.

Although the proposed construction activities may result in minor modifications of movement patterns of the few turtles that may be present during the time of marine construction, the proposed project will not result in habitat modification or degradation that significantly impairs essential behavior patterns or results in death of or injury to marine turtles. Long Island Sound, specifically the eastern portion, is an essential foraging habitat of importance for Kemp's ridley turtle juveniles that feed on green crab (USFWS 1997); however, the proposed project is confined to the western portion of Long Island Sound. It is unlikely that this species will be adversely affected by the proposed project. Furthermore, designated critical habitat does not occur within Long Island Sound, adjacent waters, or in the vicinity of the proposed route alignment. Similarly, no known nesting beaches for any of the four listed marine turtles are known to occur in this area, so impacts to these areas are not anticipated.

Iroquois should adhere strictly to its SPCC Plan to prevent any unintentional discharge of solid waste or fuels so as not to affect water quality or the potential for marine turtles to get tangled or ingest fuel or solid discharges. Iroquois is not expecting that any impacts to listed species will occur within Long Island Sound due to the construction of the proposed project.

5.2.8.2 Shortnose Sturgeon

Impacts to the shortnose sturgeon are not anticipated because they occur primarily in the lower portion of the Hudson River (from the southern tip of Manhattan to the federal dam at Troy, New York) and in the Connecticut River. Both of these areas are of considerable distance from the proposed project area (NYSDEC 2001; McDaniel 2001a; Thalhauser 2001). Within this region, shortnose sturgeons occur in salt water portions of rivers and are confined primarily to the nearshore areas adjacent to their natal streams. During the April to May spawning period, they migrate upriver to spawn in freshwater. Because this species prefers estuarine environments rather than open marine environments, such as Long Island Sound, they are not likely to be found in the vicinity of the proposed project area. Because of their mobility, should this species enter the project area during construction activities, they would likely avoid the area where construction is taking place. Therefore, it is anticipated that the proposed project would not result in habitat modification or degradation for this species or result in the death or injury of this species. No critical habitat has been designated for the shortnose sturgeon in Long Island Sound or its adjacent waters.

5.2.8.3 Marine Mammals

Potential impacts to marine mammals from pipeline construction include noise/vessel disturbances that may effect marine mammal behavior and migration patters and collisions with construction vessels. Most evaluations of oil and gas activities have concluded that both types of impacts are unlikely due to the negligible overall increase in vessel activity associated with the proposed project. Vessel and aircraft associated with oil and gas have been shown to disrupt normal behavior and activities of these species, however, long-term changes in seasonal habitat use or migratory patterns have not been documented. It is unlikely that vessels or aircraft associated with the proposed project would encounter any of the subject marine mammal species given the frequency of occurrence of these species in Long Island Sound. Construction of the proposed ELI Project is expected to have no affect on endangered or threatened marine mammals in Long Island Sound or its adjacent waters due to the fact that these species are not common in the vicinity of the proposed project.

Increased ship traffic and discharge may lead to lowered water quality that could result in avoidance by certain marine mammal species. However, the construction and operation of the proposed ELI Project is not expected to lead to a significant increase in vessel traffic in Long Island Sound. The possibility of significant releases of liquid petroleum other than minor, incidental spills of vessel fuel and lubricants during pipeline construction are non-existent, due to the proposed pipeline transporting natural gas. Solid waste discharged from vessels may also adversely affect marine mammal species where they may become entangled in floating or submerged debris, or ingest plastic material with deleterious effects.

Collisions between construction vessels and marine mammals may potentially occur, but are not expected to occur because most vessels use for pipeline construction are not fast-moving vessels, and because these species are not common and regularly occurring residents of Long Island Sound. Most barges, tug boats, and supply vessels associated with the offshore construction spread travel from one to ten knots per hour and crew boats may travel at speeds of 20 kn. Due to the relatively low speeds of these vessels, the restricted time period of pipeline construction in any one location, the widely scattered distribution of marine mammals, and the rarity of these species in Long Island Sound, would seem to make such impacts unlikely.

Construction disturbances associated with the proposed project are not anticipated to impact marine mammals because the construction schedule is timed when few marine mammals are likely to be present in Long Island Sound. Although the proposed construction activities may result in minor modifications of movement patterns of the few marine mammals that may be present during the construction period, the project will not result in habitat modification or degradation that significantly impairs essential behavior patterns or results in death or injury to these marine mammals. Should there be any impact, it would primarily be temporary disturbance to foraging and displacement of animals near the construction areas (Gilbert 2001). Additionally, no marine blasting is proposed. If marine blasting is required, Iroquois will first file a marine mammal protection plan and receive written approval from NMFS before any blasting occurs. Any project-related impacts to marine mammals in the project are would likely be short-term and would not adversely impact these species. Because of their mobility, it is likely that these species would be able to avoid the project area during construction activities.

5.3 Socioeconomic Environment

Impacts are expected to be minimal for most socioeconomic resources along the route, including petroleum infrastructure, shipping and navigation, fisheries, cultural resources, and public lands. Impacts associated with ocean disposal sites are not discussed because impacts associated with these areas are not expected to occur. The only impact from pipeline construction on ocean disposal sites would be if the newly installed pipeline occupied space for the intended disposal of dredged material.

5.3. Potential Impacts to Pipeline Infrastructure

Marine surveys did not identify any pipelines located along the pipeline corridor in the Long Island Sound and; therefore, no impacts to pipeline facilities will occur.

5.3.2 Potential Impacts to Shipping and Navigation

Long Island Sound receives a high volume of vessel traffic from various sources such as commercial shipping, ferry services, sightseeing tours, and recreational boating. The proposed construction of the ELI Project will generate and add to the overall marine vessel traffic within Long Island Sound. The offshore construction spread will consist of one lay barge, survey vessel, two or more anchor handling tugboats, two or more pipe supply barges, escort boats (if required), personnel carriers, utility launches, and other marine support equipment as required. This vessel traffic, when added to the existing vessel traffic, may increase competition for berthing space and berthing costs as well as increasing the possibility of vessel collisions, harbor congestion, and disturbance from noise or vessel wakes.

All navigational regulations and precautions of the various Port Authorities and USCG would be followed closely so as not to impede vessel traffic and avoid vessel collisions during the time period required for pipeline construction. Additionally, Iroquois would coordinate all construction-related activities and relay construction scheduling to the USCG and a NTM should be issued, which discusses pipeline construction and installation details. Communication between vessels associated with the offshore construction spread and vessels in the vicinity of installation activities would be ongoing through all phases of construction to avoid potential collisions. Similarly, all vessels contained within the offshore construction spread would be well lighted at night so that they may be clearly identified by other vessels in the surrounding vicinity.

5.3.2.1 Commercial Shipping

No significant impacts to the commercial shipping within Long Island Sound are expected from the offshore construction of the proposed pipeline. Installation of the pipe and subsequent burial is expected to be completed within three months and, therefore, should not significantly affect or interfere with commercial shipping lanes. At locations where shipping lanes are crossed by the proposed alignment, these areas would be well marked and lighted to reduce the potential for vessel collisions. Due to the linear nature of this project, installation activities and associated barges, boats, and tenders would move along the route quickly and do not remain in one place for long. Hence, minimal disturbance will occur to shipping lanes and the short duration the construction spread will be in any given place will not significantly interfere with commercial shipping. The offshore areas will allow for movement of commercial vessels from one area to another so that the commercial shipping can be ongoing in other areas as pipeline installation moves across Long Island Sound.

5.3.2.2 Ferry Service

No impacts on ferry service are anticipated from the construction of the ELI Project, as neither of the two ferry routes that cross the Long Island Sound from Connecticut to Long Island are located within 10 miles of the proposed pipeline route.

5.3.2.3 Sightseeing Tours

No impacts on sightseeing tours are anticipated from the construction of the ELI Project. Offshore construction would be conducted during winter months, which would eliminate any conflict with the sightseeing tour season for the Thimble Island, which runs from mid-May through Columbus Day in October.

5.3.2.4 Mooring Areas, Anchorage Areas and Lightering Areas

No mooring areas are charted within one mile of the proposed pipeline route within Long Island Sound (NOAA 1984). No impacts to mooring areas are expected to occur because of their significant distance from the centerline of the proposed route. Vessel traffic contained within the construction spread will be at a sufficient distance from this mooring area that no interference with its operations are expected before, during, or after construction is completed.

The proposed pipeline will not cross any area identified on NOAA navigational charts as designated anchorage areas (NOAA 1984, Rossiter, 2001). The nearest designated anchorage area is located approximately six miles to the east of the proposed centerline (NOAA 1984, Rossiter 2001), corresponding with approximate MP 0.0. At this distance, no impacts to the anchorage area are expected and normal operations of this anchorage area are expected to occur during the construction and operation of the proposed project.

The ELI Project has been designed so as to avoid all lightering areas located within Long Island Sound. The nearest designated lightering zone to the proposed pipeline route is the Port Jefferson lightering zone, located approximately 4.1 miles to the southeast of the proposed alignment (NOAA 1984 and 1998).

5.3.3 Commercial Fisheries

Iroquois expects that impacts to fishery resources will be negligible. Potential effects on commercial fisheries may result from temporarily lowered water quality due to trenching, emplacement of the pipeline, or fuel spills (MMS 1997).

5.3.3.1 Potential Indirect Impacts to Habitat of Adult Demersal and Pelagic Fish

Potential impacts from pipeline construction on prime habitat of adult demersal and pelagic finfish have been evaluated by Brosius *et. al* (1983). It is expected that most species of demersal and pelagic finfish species would simply avoid areas under construction, and that potential impacts would be temporary and minor, resulting in displacement followed by rapid recolonization. The more sedentary demersal fish may be reluctant to leave the area and may sustain impacts due to either oxygen depletion (from bacterial oxidation or resuspended organic materials) or damage to the gills through abrasion or fouling by suspended solids. The increased turbidity due to any bottom water disturbance may interfere with the filter feeding activities of certain species. Although the installation of the pipeline could cause an increase in sediment loads, the effects are expected to be localized and short-term, since the suspended sediments will resettle after the pipeline has been installed.